KNOWLEDGE

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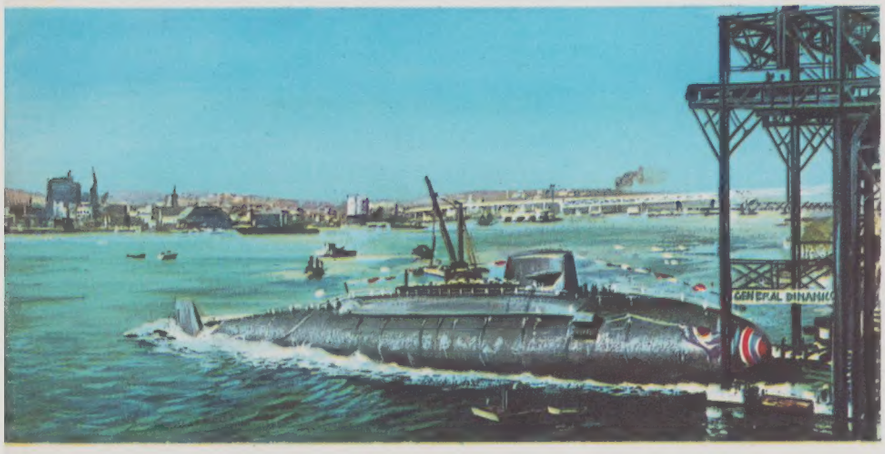
WARFARE



The launching of the Ethan Allen *– a Polaris submarine whose armaments could easily wipe out London*

IN the Middle Ages war was considered to be a sort of sport: a thing which a gentleman should be good at. Only a few thousand were killed in a battle, which was often fought as a personal quarrel between rulers. Neither these battles nor their results really affected the daily lives of the people of the warring countries. However, with the growing nationalism of the 18th and 19th centuries, the populations became much more identified with the military conflicts of their governments. Yet it was not until the 20th century that whole nations became totally involved in warfare. In the First and Second World Wars not only were a large proportion of the population employed in the actual fighting; an even larger section was helping in the war effort. Moreover, in the Second World War, with the development of long-range bombing, civilians found themselves in the front line of attack. The two great wars of this century were also *world* wars because, with the world-wide political interests of the belligerents, the world was the battle-ground: indeed in the Second World War one of the first naval battles was fought off the coast of South America. Today the concept of war has changed again. Now nations are not only able to pit their entire strength against each other in a world-wide struggle – they can totally destroy their opponents.

A gigantic AC Convair B-58 ('Hustler') supersonic bomber – the bomber has been replaced by rockets as the spearhead of attack

The legality of war

Up to the end of the 18th century lip-service was paid to the mediaeval idea of a *just war*: that of a nation not going to war unless it had suffered an injustice by another. But in the 18th century *reasons of state* became generally accepted as justifiable reasons for waging war, and thus indefensible acts of aggression like Frederick the Great's seizure of Silesia and the partitions of Poland became common.

A Minute-Man rocket – military might today is gauged not so much in armies but in rockets

A new legal code of conduct for warfare appeared, complete with its own legal terminology. Two or more countries fighting were called *belligerents*, and if a country wanted to remain *neutral* it had to be completely impartial, and treat all the belligerents equally. In the event of a rebellion the rebels might be recognised as belligerents by the other powers, and therefore qualify for such advantages as laws relating to prisoners-of-war. In addition the government being rebelled against could not legally ask help from nations which had recognised rebels as belligerents, and the recognising countries could trade with both factions without violating the principle of equal treatment.

Previous page: King Darius of Persia leading his troops into the disastrous battle against Alexander the Great in 333 BC – these tremendous battles of ancient times were, until the 19th century, the nearest the western world was to come to 'wars of peoples'.

KNOWLEDGE NEWS

Week beginning 25th August 1963

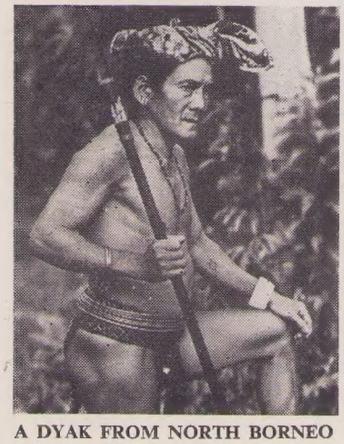
A MALAY

MALAYSIA

This is the age of new states. Very soon* another comes into being – Malaysia. The people of this state will be very different to each other, and they have many great problems to solve. Hebe Spaull, author of many books on world affairs, has just returned from a visit to Malaysia. She has spoken to many of the people who will shape its future, including the Prime Minister. This week she gives 'Knowledge' readers her views on the new state.

**By the time many overseas readers get their* Knowledge *Malaysia may already be in existence.—Editor.*

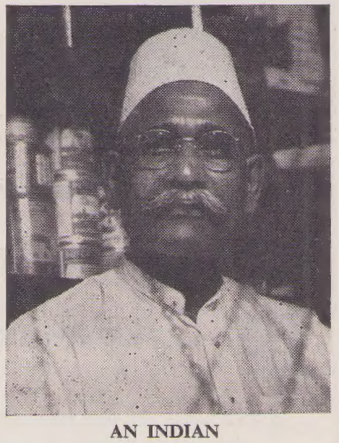
A CHINAMAN



A DYAK FROM NORTH BORNEO

MALAYAN ABORIGINAL GIRLS

A SAKAI – A JUNGLE ABORIGINAL



AN INDIAN

WHEN I tell people I have just come back from Malaysia some look a little blank and want to know just where it is. This, perhaps, is not surprising because, at the time of writing this article, the name Malaysia has not yet appeared on any map. It is, in fact, a new state that will shortly come into being in South-east Asia.

The four territories

The biggest part of the new state is Malaya, which is about the size of England and Wales. Three other territories within the British Commonwealth – Singapore, North Borneo, and Sarawak – have agreed to join with Malaya to form the new country. Brunei was to have joined but at the last moment decided not to.

When the traveller arrives in Singapore – one of the world's busiest ports – one of the first things that he or she notices is that the great majority of the people are Chinese, though there are people of other races too. Singapore is an island, about the size of the Isle of Wight, but with one and a half million people living on it. Although it is an island you do not need to take a boat to get to Malaya, for a causeway joins Singapore to Johore, one of the eleven states which make up Malaya.

In Malaya there are rather more Malays than Chinese, and there are other races too. Nine of the eleven states are ruled by Sultans. Once every five years these nine Sultans choose one of their number to be King of the whole Federation. This is the only country in the world where there is a different King every five years, and this arrangement of electing a Sultan to be a five-year King will continue in the state of Malaysia.

There is one thing, however, about the way Malaysia will be governed that is very British. This is the method by which the Malayan (soon to be Malaysian) Parliament, which meets in Kuala Lumpur, the capital, carries on its work. I was there when the King, accompanied by the Queen, opened Parliament, and the ceremonial was similar to that followed at Westminster when the British Queen opens Parliament. So was the way in which Parliament carried out its business the next day. When the first session of the Parliament of the new country of Malaysia meets it will do so in a fine new parliament building that dominates the city of Kuala Lumpur. When I talked to the Prime Minister, Tunku Abdul Rahman, he said to me: 'To show our love of democracy we are building a monument in the form of a Houses of Parliament.' Malaya had, of course, learned the British way of doing things during the many years the states were under British rule. Now the country is an independent-member of the British Commonwealth.

Most of the political problems which Malaysia will have to try to solve arise out of the many different races who make up its citizens. Apart from Malays and Chinese there are Indians, Indonesians, Eurasians, Europeans, and some thousands of Malayan aborigines. Now, with the coming of Malaysia, some new groups are being added, including the famous Dyaks of North Borneo.

Chinese versus Malays

There is a good deal of rivalry between Malays and Chinese. The Chinese work very hard, they are fond of learning, and are very clever business people. So it is not surprising that many of the richest people are Chinese. The Malays are gay, friendly people who do not take so readily to modern city life. They are largely farmers and fisherfolk, and all along the east coast, which borders the South China Sea, nearly all the people are Malays. Until the past two or three years there was not much coming and going between the east and west coasts because communications were difficult – there were many rivers that could only be crossed by ferry. Life is made harder for these Malay folk on the east coast because here, unlike the west coast, the monsoon sets in from November to February, and this bad weather creates a good deal of unemployment. But things are beginning to improve and bridges are being built to replace some of the ferries. The government is doing a great deal to help the Malay people who are often the poorest members of the community. It is giving special help to enable Malay children to obtain higher education and to study abroad. It is also giving special government subsidies to build housing estates.

Some non-Malays are resentful that Malays should be singled out in this way for special help. When I asked a clever Eurasian girl if she was going to try to get a special scholarship to study in the United Kingdom or Australia she replied, a little bitterly, that

[*continued on page 2*

MALAYSIA *continued*

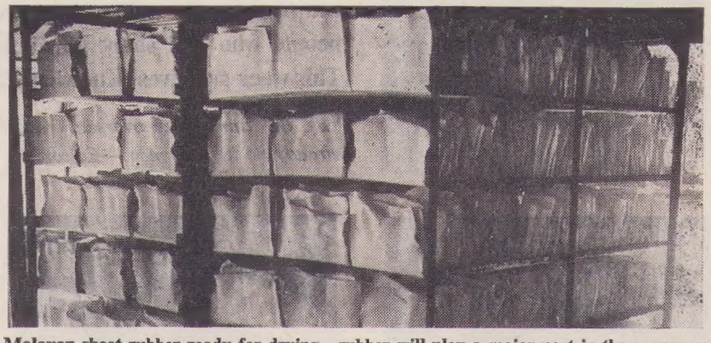
there was little chance for any but Malays to get such grants. When one asks Malays about this they reply that there are so many rich Chinese and Indians that they can afford to pay to send their children to the university or to study abroad and so do not need the special help that Malays – who after all are the majority people – need.

Tunku Abdul Rahman – Prime Minister of the new state.

The other big problem Malaysia has to face is how to bring more prosperity to the country. Compared with most Asian countries she is not poor, but two-thirds of the country is still covered with jungle, and the country's wealth depends largely on rubber (which now has to compete with synthetic rubber) and tin, of which there is not so much left in the mines as formerly. So Malaya is starting new industries and persuading farmers to grow new crops as well as improving her rubber plantations. To provide new lands for cultivation, jungle is being cleared, sometimes many miles from a highway, so that new roads have to be built to reach them. I visited one such settlement in the heart of the jungle into which two thousand people had moved and were planting young rubber trees. No country in the world has cleared so much virgin jungle to provide land for landless peasants as has Malaya.

No state can start new industries on modern lines without scientists and technicians. Both Malaya and Singapore are spending an increasing amount of money on education. Singapore has a special problem in regard to education as half her population is under the age of eighteen. She, therefore, is spending a quarter of the state income on education.

There will be many Chinese in the new state. This is a Chinese religious procession at Johore Bahru in Malaya.



Malayan sheet rubber ready for drying – rubber will play a major part in the economy of Malaysia.

Letter from the Editor-in-Chief

37 HERTFORD STREET, LONDON, W.1.

LAST week you will remember I said I would tell you more about place names. Of course this is a colossal subject and I can only say a few words about English place names. On the whole, place names in countries in which English is spoken are either based on the Anglo-Saxon tongue or the language of the original inhabitants. In England the place names are, generally, a mixture of Anglo-Saxon and Celtic, with a little Latin.

There are many reasons why a place should get its name. The name may be purely descriptive, like Oxford (Oxens' ford). It may commemorate some event, like Massacre Creek. It may be called after a person – Edin (Eideann or Edwin) burgh.

In place names based on Anglo-Saxon the endings can tell you a lot. For instance, names ending in 'bury', 'burgh' or 'borough' are generally derived from the Anglo-Saxon word meaning a fortified place. 'Ton' is derived from farm or enclosure – not town; 'don' from hill; 'den' from valley; 'hurst' from wood or hill; 'stoke' and 'ste(a)d' from a place or site; 'field' from open space; 'ham' from settlement or manor. 'Ings' is derived from the Anglo-Saxon 'ingas', meaning 'people of'. Thus 'ington' means 'farm of the people of'.

The Scandinavians had a considerable influence on our place names: 'by' comes from the Danish for village.

Celtic place names are different from Anglo-Saxon in that they more often put the main element first. There are many names in Scotland and Ireland beginning with 'Dun' (meaning 'mount') and 'Inver' (meaning 'mouth of').

Most of the English shires either take their name from a group of people or a town. Thus Middlesex is named after the Middle Saxons, and Yorkshire is named after the town of York. Shire comes from the Anglo-Saxon 'scir' meaning share.

I wish I could write more about this fascinating subject, but I hope what I have written will encourage your interest in it.

John Chancellor

DID YOU KNOW?...

A squirrel can live to about 7 years of age, a hare to 8, sheep to 10 and cows to 15. Cats live 15 years or more; foxes up to 16 years; bears, wolves and dogs to 20; pigs, dolphins and porpoises for 30 years. Horses (known to reach 62 years of age) live on average 25–30 years. Lions can live for 70 years, camels and ravens for 100. An eagle kept in Vienna reached 104. Tortoises often reach 100 or more, and elephants can live for 60 years.

* * * * * * * * *

Perching, picking, burling, beetling, milling, teasling and stentering are all processes in the manufacture of woollen cloth. Double-thread weaving, known as 'worsted', originated in the village of Worsted, near Norwich. The town of Linsey gave its name to the fabric known as 'linsey-wolsey'. Kersey and Mere in Suffolk produced the first 'Kerseymere' cloth. The first blankets were made by Thomas Blanket of Bristol in about 1338.

Ginning, baling, mixing, scutching and carding are some of the terms used in the processing of cotton. There are nearly 140 types of cotton plant, which was first produced in India in the 6th century B C.

NEXT WEEK

Results of

HISTORICAL

NEWSPAPER

COMPETITION

FACTORS

A word game

The following statements are either 'true' or 'false'. When one is 'true' score the *first* number, but if you think that it is 'false' score the *second* number. Change the numbers into letters (1=A; 2=B; and so on). Put these letters into the squares to make a five-letter word reading down the frame.

The collective noun for a group of geese in flight is a gaggle (15) – (1).

Sir James Barrie wrote Water Babies (22) – (18)

A tumbler is a kind of pigeon (18) – (6)

Spermaceti is an Italian dish (13) – (15)

The first man to swim the English Channel was called Matthew Webb (23) – (3)

ANSWER

Arrow

(A flock of geese on the ground is called a gaggle, but a flock in flight is known as a 'skein'. Charles Kingsley wrote *Water Babies*, and spermaceti is a wax-like substance obtained from whales)

AVERROËS

Averroës discusses Aristotle with one of his pupils

A FIERCE, snarling man brandishing a bloodstained scimitar – that is the picture most Christians had of a typical Muslim Arab in the Middle Ages. It was a picture encouraged by the Crusades, by Muslim pirates and raiders, and by some Church leaders who would tell any story to discredit the infidel. But it was a long way from the truth. Many Arabs in the Middle Ages were far more civilised, far more humane and tolerant, and far more cultured than the Christians. Nowhere was this more so than in some of the cities of Muslim Spain in the 12th century – above all in the city of Cordoba. There, in the year 1126, was born a man who was one of the most brilliant thinkers of his age, whose fame was to spread throughout the whole Christian world. His name was Abu'l-Walid Muhammad ibn Ahmad ibn Muhammad ibn Rushd. To western Christians, who liked to turn all Arab names into words which could be pronounced in Latin, he was known simply as Averroës.

A man of many parts

Today it would be very unlikely for a famous doctor to be also a lawyer, a philosopher, an astronomer, and a theologian. Averroës was all these. He was born of a distinguished family. His father was chief magistrate of Cordoba and the most famous teacher of law in the city. The young Averroës learned much from his father. When he grew up he became a lawyer and doctor of medicine on his own account, practising, teaching, and above all writing. He produced books on law, on general medicine, on the eye, on the principles of hygiene, on fever, and on astronomy.

In the breadth of his interests and his writings he reminds us above all of one man – the great philosopher of ancient times, Aristotle. In fact, when Averroës's fame in all other fields was virtually forgotten he was still remembered as the man who wrote one of the greatest of all commentaries on Aristotle; he was the first to try to reconcile the thought of the Greek philosopher with the Muslim religious beliefs of his time.

Religion or reason

The religion of Islam is in many ways a very simple religion. Its sacred book, the *Koran*, is purely a collection of sayings and stories of the Prophet Mahomet. It is not concerned with philosophy. Aristotle, on the other hand, was not a particularly religious man, but he was a philosopher. Averroës wanted to link these two ways of thinking; Aristotle believed that it was possible to learn everything by the profound study of material things in the world. He also believed that perfection could be achieved and recognised in purely human terms. Formal religion teaches that the Truth can only be revealed directly from God, and that perfection is a quality belonging only to God.

The Moorish philosopher Averroës (1126–1198), famous for his commentaries on Aristotle

Averroës reconciled reason and revelation by saying that there were three classes, who must each have different treatment according to what they were capable of understanding. First, there were ordinary, unlearned men who were completely satisfied by merely being told what they ought to believe and did not question it. Averroës said that for these simple men the bare words of the *Koran* were enough. Secondly, there were men who were satisfied with arguments which were fairly persuasive. And thirdly, there were the very intelligent men, who liked to have everything proved to them beyond all shadow of doubt. These, said Averroës, had to be prepared to discover that although reason and religious revelation did not always *seem* to lead to the same conclusions, ultimately they did. It was not always given to man to see how. Where there was conflict, the word of the Prophet Mahomet rather than that of the Philosopher Aristotle should be accepted. So the intelligent man had to accept that he was not likely to be completely satisfied in this world.

Aristotle, Averroës, and Aquinas

This conflict between Aristotle and the revealed truths of religion was later going to trouble Christians, just as it troubled Averroës. Averroës's great achievement was not so much that he solved the problem – for he did not do that – but that in trying to solve it he produced an Arabic translation of Aristotle's works, which was as near to what Aristotle had actually written as anyone could get at that time.

Without the work of Averroës it is doubtful if St Thomas Aquinas could in the next century have made his great 'synthesis', or joining together, of Aristotelian and Christian thought. Aquinas succeeded in doing for Christianity what Averroës had tried to do for Islam; he made use of the ideas of the great philosopher without letting them contradict his faith; in fact, he reconciled reason with religion.

Inspired infidel

His own people were very suspicious of Averroës. He was branded as a heretic and exiled by the Muslims of Spain. However, the ban was lifted shortly before he died in Morocco in 1198. Although to Christians he was an infidel, his reputation was so great that his works were widely read and debated in the greatest universities of Europe.

TIBETAN ART

A TIBETAN'S religious belief is so strong that it dominates his daily life. Prayer-wheels turn incessantly, prayer-flags wave on the roofs of houses, and prayer-lamps burn in every house. The gods, Tibetans think, are everywhere. They see their anger in the hailstorms that beat down on the growing crops, and their good will in the rain that makes the land fertile and fruitful. The lamas interpret the will of the gods, and pray to them on behalf of the people. So, as you might expect, before the Chinese invasion (see page 2070) Tibetan art was predominantly religious; it remains to be seen what effect atheistic Communism will have.

Bound by tradition

Tibetan art has grown out of contacts with other great cultures during the past 1,000 years. Pilgrims from India, caravans along the old silk and wool trade routes, nomads from Central Asia, and travellers from China all passed through Tibet, and left their mark on Tibetan art.

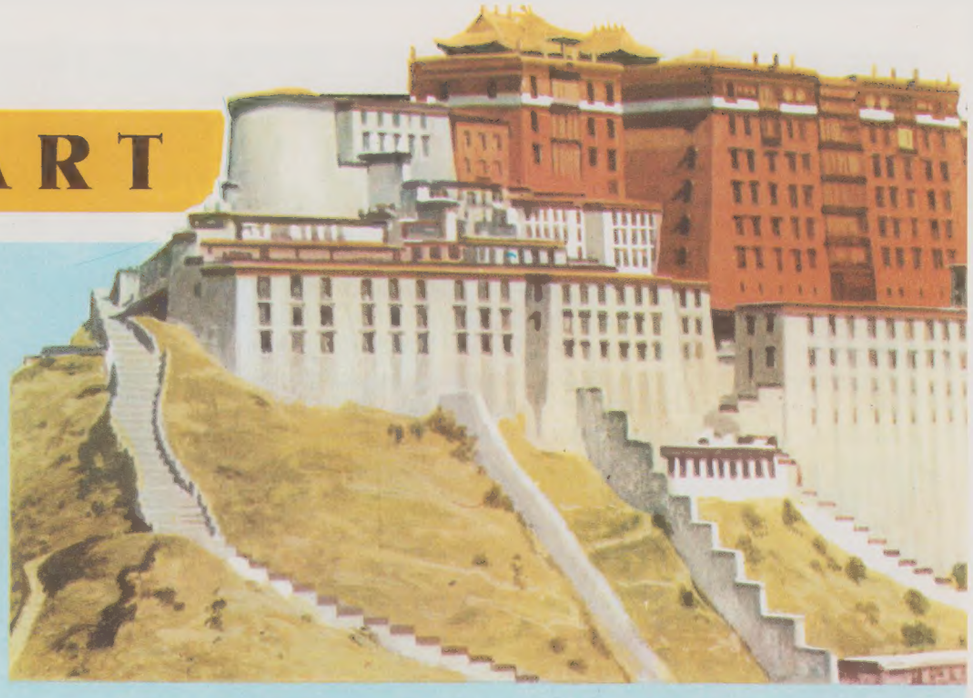
While the western artist expresses in painting or sculpture his own, personal view of what he sees, the Tibetan artist is anonymous. He paints and carves in a style centuries old. He does not choose new subjects, for they are already fixed for him by religious traditions. The appearance and gestures of the gods, and even of the most fantastic demons and monsters, have been fixed for centuries, and cannot be altered.

Tibetans worship Buddha as a god (see page 2182), which he never claimed to be, and they worship many other gods and spirits, and believe in magic and demons.

In the *gon-kang*, the dark, crypt-like chapels or temples which are found all over Tibet, pictures of these gods are painted on the walls, looking more like devils or monsters. But they are, in fact, good spirits, who only assume terrifying shapes to frighten away evil.

Architecture is the art form in which Tibetans display most individuality – their painting and sculpture reflect Indian and Chinese influence. Tibetan architecture has huge, simple proportions, vast surfaces, and buttressed walls which slope inwards towards the top. The monasteries, which are the most important buildings, look like fortresses.

All over Tibet there are *chortens* or walled towers, from 6 to 60 feet high. They usually contain sacred pictures and writings and are sometimes the tombs of lamas. Each part of the structure symbolises one of the elements; the base represents earth, the tower water, and two carvings at the top space and air.



The gigantic Potala Palace was built 300 years ago by the fifth Dalai Lama. It is over

THE POTALA PALACE

The Potala Palace at Lhasa is a gigantic fortress rising out of sheer rock and is the greatest work of Tibetan architecture. Many people consider it the most impressive building in the world. Its golden roofs, crowning the gleaming white and red

Tibetan sculpture is sublimely beautiful when it represents the gods in their serene and merciful aspects. The finest of this sculpture shows the gentle face and gestures of Buddha, who was transformed after his death from a teacher into a god – or rather several gods, for he has different aspects. Sometimes the sculptured figures in temples are of Bodhisattvas, who are blessed beings who have reached the stage of perfection, but have chosen to stay on earth to help their fellow men.

Statues are made of gold, silver, bronze, copper, stone, and – on ceremonial occasions – even of coloured butter carved into figures and displayed in the streets!

This crowned Buddha (left) on a gold throne, from the temple of Ri-bo-k'ang, shows Indian influence.

The life-size statue of Buddha in Ri-bo-k'ang, one of the oldest Tibetan temples

913 feet from end to end, and the traditional pilgrimage all the way round it covers five miles

A painting of the fifth Dalai Lama, Ngawang (1617–1682), who built the Potala Palace and is still called the 'Great Fifth' by Tibetans. The decoration and the serene features show Chinese influence, though the intensity of the colours is Tibetan

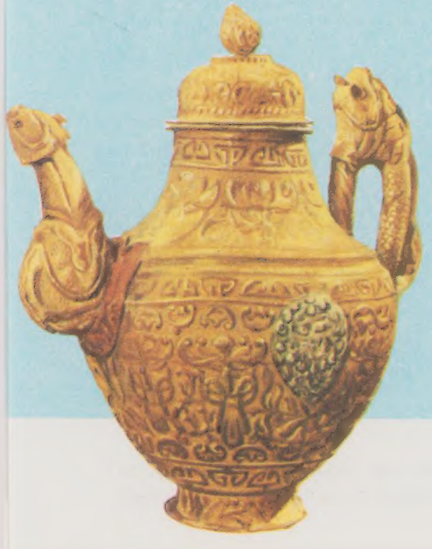
walls, are a famous landmark for pilgrims approaching the sacred city. The Potala Palace was the home of the Dalai Lama who is traditionally thought by Tibetans to be the reincarnation of a god known as the Lord of Mercy, and the spiritual and temporal head of the Tibetan state.

SPLENDID BANNERS

The banners used in religious processions at festivals are often precious works of art. They are painted on cloth, or sometimes embroidered and mounted on silk. The banners generally show scenes from the life of Buddha and other benevolent gods. The designs are often reproduced by means of transfers, because it is Tibetan tradition to copy old designs rather than invent new ones. The large banner on the right shows Buddha seated with a disciple on either side, and all around him are lesser gods. The figure of Buddha looks Chinese, but the picture as a whole has a resemblance to some Indian paintings.

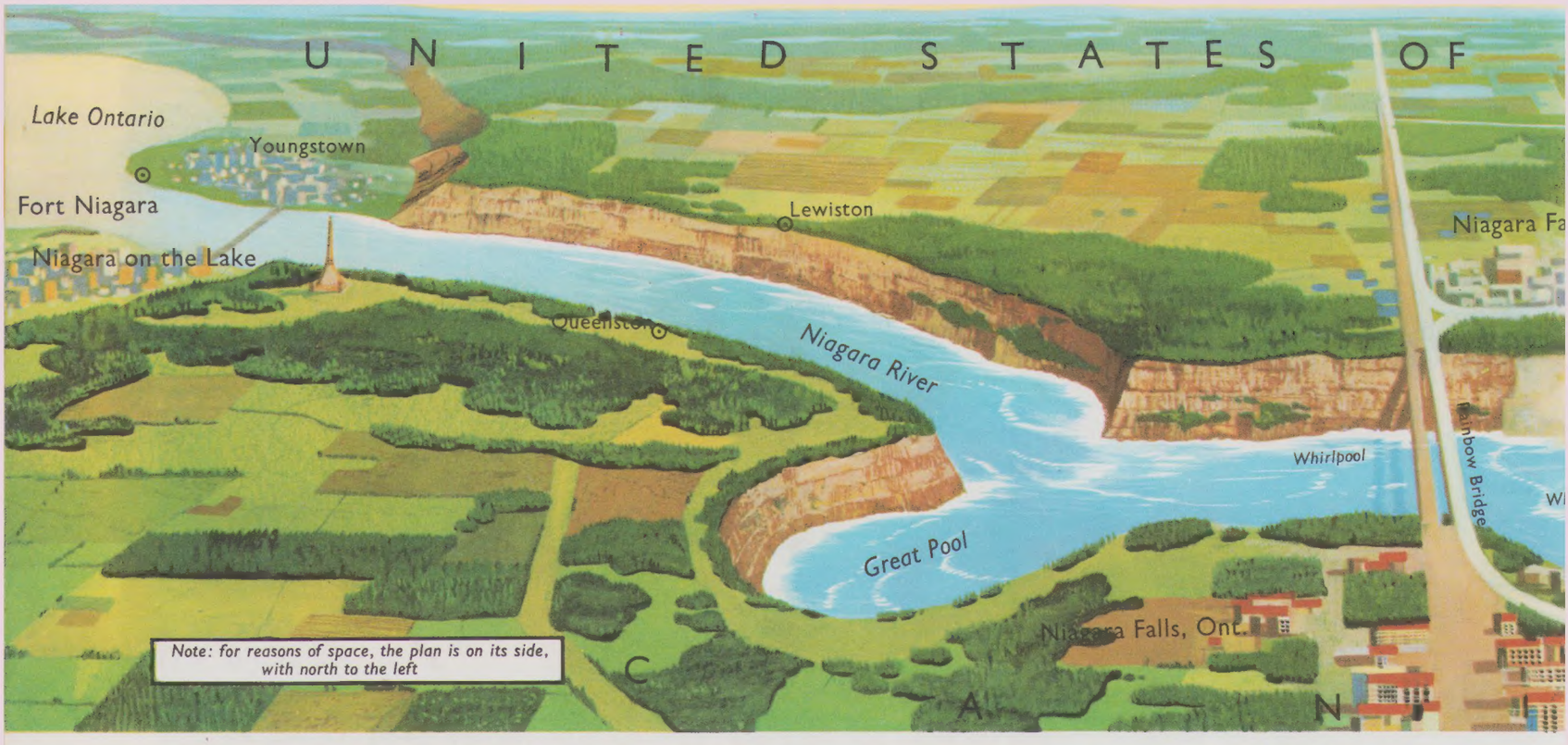
ARTIST CRAFTSMEN

Tibetan craftsmen have natural good taste, and the good craftsman's feeling for his materials. Goldsmiths' work is superb, and teapots look like little brass and silver fortresses, with dragons entwined round spout and handle. Good design and ornamentation are found in quite ordinary possessions: belts; weapons; teacups decorated with coral and silver; copper braziers; saucepans; and even the nomad's wooden bowl, beautifully shaped and lined with silver.



A Tibetan teapot made of beaten brass, decorated with silver medallions which (characteristically) have a symbolic meaning

It was hoped that the medallions representing protective gods on this copper helmet would keep the wearer safe in battle



A panoramic view of the Niagara Falls area,

THE NIAGARA FALLS

'BETWIXT the Lakes Ontario and Erie, there is a vast and prodigious cadence of water which falls down after a surprising and astonishing manner, in so much that the Universe does not afford its parallel.'

This description of the magnificence of Niagara Falls was written in 1697 by Father Hennepin, who accompanied the French explorer René de La Salle on his expedition to Lake Erie in 1678. The Iroquois Indians referred to the Falls as 'Thunder of Waters', and the word Niagara comes from the Indian name.

The Niagara Falls are on the Niagara river, a stretch of water 34 miles long which joins Lake Erie in the south with Lake Ontario in the north. The Niagara river drains an area of 255,000 square miles of the North American continent, and about one and a half million gallons of water rush downstream every second. Between the two lakes the level of the river drops over 320 feet. The greater part of this drop occurs in the eight miles between Grand Island and the famous whirlpool.

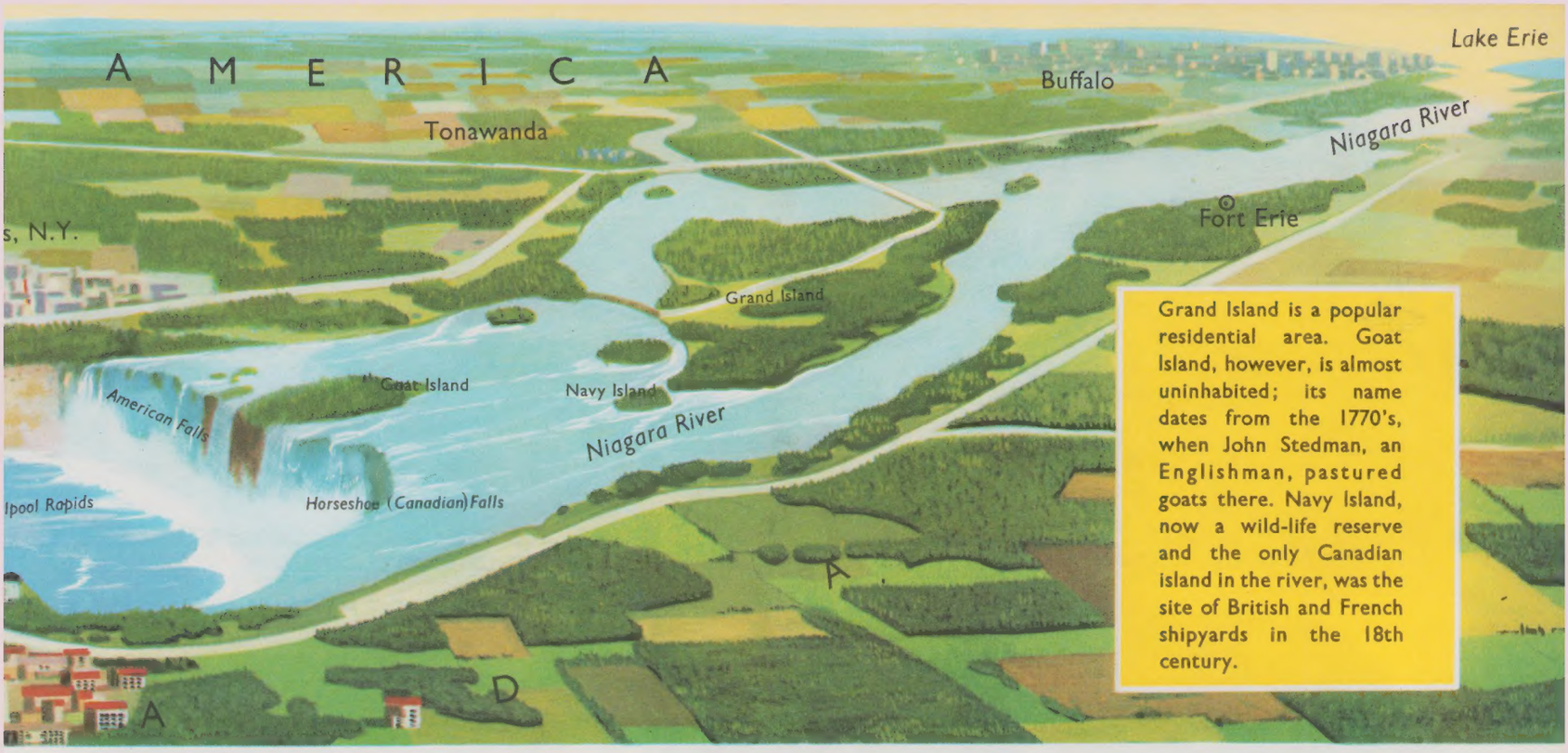
On each bank of the river, level with the Falls, is a city called Niagara Falls. One is in New York State, U S A, and the other is in the state of Ontario, Canada; for the international boundary runs down the middle of the Niagara river. Just as there are two cities, there are two waterfalls; the American Falls are 1,000 feet across, and 167 feet high, but carry only 5 per cent of the water flowing downriver. Goat Island, perched right on the edge of the Falls, separates the two cataracts. By far the most impressive are the Canadian Falls, also known as the Horseshoe Falls. They are some 2,500 feet across the top, and plunge 160 feet to the pool below, carrying 95 per cent of the water of the Niagara river. The great volume of water flowing over the Canadian Falls has worn away the rock to the distinctive horseshoe shape which gives the Falls their name. Over the last 20 years, however, the governments of the United States and Canada have combined in a scheme to divert some of the water, before it reaches the Falls, for hydro-electric power; this serves the double purpose of producing electricity while reducing erosion on the crest of the Falls. The beauty of the Falls has not been affected because the amount of water to be taken from both sides of the river is limited by an agreement, signed by both countries in 1950. The power produced by this scheme has encouraged the growth of industry in the two cities of Niagara Falls.

Below the Falls the river suddenly narrows and rushes through a gorge less than 400 feet wide in places, and over the Whirlpool Rapids. The whirlpool lies in a sharp bend where strong currents circulate beneath a deceptively calm surface, presenting a striking contrast to the turbulence of the rapids.

The two cities of Niagara Falls are famous as tourist resorts. One of the best vantage points from which to view the Falls is Table Rock House, on the Canadian side. Here visitors are provided with waterproof clothing (to protect them from the spray) and taken down by lift through passages cut in the solid rock, until they are behind the Falls themselves. It is an unforgettable experience to stand and watch the millions of tons of crashing water. Behind the American Falls the water has worn a hollow known as the Cave of the Winds, which can also be reached by a system of lifts and underground passages. Prospect Point, on the American side, and Oakes Garden Theatre on the other, both give a good general view, while motorists pass in front of both cataracts along the Rainbow Bridge, a 1,500-foot-long suspension bridge that links the twin cities of Niagara Falls. A cable car above the whirlpool gives an exciting view of the swirling rapids.

SPECTACULAR STUNTS

The Niagara Falls have always attracted stuntmen and exhibitionists of various kinds. The most famous of all was a Frenchman, Jean François Gravelet Blondin. Large crowds gathered when Blondin set out from the American side, on 30th June 1859, to cross the gorge (a distance of 1,300 feet) along a cable. When he had gone only 35 yards,



Grand Island is a popular residential area. Goat Island, however, is almost uninhabited; its name dates from the 1770's, when John Stedman, an Englishman, pastured goats there. Navy Island, now a wild-life reserve and the only Canadian island in the river, was the site of British and French shipyards in the 18th century.

showing Lake Ontario in the north (left) and Lake Erie in the south (right)

Blondin sat down, lay on his back, stood on one foot, then continued on his way. At the centre he stopped, lowered a cord to the deck of a steamer below, pulled up a bottle and drank from it. Just 18 minutes after starting out, he arrived on the Canadian side. The return journey took only seven minutes. Blondin later added more flourishes to his performance, by walking across the cable either at night or blindfolded, backwards or pushing a wheelbarrow, with baskets on his feet or even on stilts. Perhaps the most famous crossing was one Blondin made with his manager, Harry Colcord, on his back. Colcord weighed 10½ stone, and Blondin also carried a 38-foot-long balancing pole that weighed over three stone. He told Colcord to 'rest like a dead weight' and not to attempt to regain his balance, should Blondin stumble.

During the crossing, Colcord had to get off Blondin's back seven times to allow him to rest. But when they reached the point in the centre where the cable dipped, Blondin started to totter, and for a moment it seemed that the two men would be hurled into the roaring waters below. Unable to regain his balance, Blondin ran along the cable towards the next guy-rope. There he paused for breath, putting one foot on the guy-rope to steady himself. The guy-rope promptly snapped, endangering the two men once more and bringing a gasp from the crowd. After a short rest, Colcord climbed onto Blondin's back again and they slowly advanced to the safety of the cliff.

Other stuntmen imitated Blondin; some were better, but none were as famous as he was. The only woman to cross the Niagara Falls on a rope was Maria Spelterina, who did it with handcuffs on her wrists and ankles. Other people went over the waterfall inside barrels; however, not all of them survived. The first to succeed was a woman, Mrs Anna Edson Taylor. Some tried to swim the fierce rapids, including Captain Webb (a famous English Channel swimmer), but even he was drowned amid the huge waves. Most remarkable of all, perhaps, is the story of a little boy who accidentally fell out of a boat above the Falls. He was swept over the edge by the current, but rescued unharmed from the pool at the bottom of the waterfall.

THE *MAID-OF-THE-MIST*

The first *Maid-of-the-Mist* was built in 1846 at the base of the Falls. She was a little steamer that took visitors round in the small area of navigable water between the Falls and the rapids. In 1861 she was sold, and the new owner demanded that she be delivered to Lake Ontario – a seemingly impossible feat, unless the steamer was carried overland. However, the captain and crew of two took *Maid-of-the-Mist* on a memorable voyage over the rapids; the huge waves swept over her and she lost her funnel, but arrived safely on the other side and continued to Lake Ontario. Today, there are two boats called *Maid-of-the-Mist* carrying sightseers to within a few yards of the Falls – well within range of the spray.

The American Falls (left) and the Horseshoe Falls (right) from Oakes Garden Theatre

ANIMAL PARTNERSHIPS

IN the article on the hippopotamus (see page 1588) we mentioned the tick-bird which feeds on the parasitic insects that infest the skin of large animals. The keen eyesight of these birds enables them to detect the approach of danger more readily than the big beasts can, and the birds' cries of alarm serve to warn the animals of the approach of an enemy.

This is a case of *symbiosis* or co-operation between two kinds of animals, and many other examples of it are known. The animals do not consciously assist each other, but their ways of life have come to be adapted for their mutual benefit.

Spur-winged lapwings feeding around the mouth of a crocodile

THE CROCODILE BIRD

The spur-winged lapwing or crocodile bird is very common on the shores of African rivers, and is often seen in the company of crocodiles, especially when the great reptiles are sleeping on sandbanks. The crocodiles are infested with leeches and the birds feed on these creatures, thereby helping to rid the crocodiles of their parasites. It is even said that the lapwing will venture into the reptile's mouth and pick leeches from its gums.

A bird and a tuatara share a burrow

TWO IN A BURROW

On some small islands off the coast of New Zealand lives a very rare and strange reptile called the tuatara. These islands are also inhabited by great numbers of sea birds called petrels, which make their nests in burrows in the ground. The tuatara also lives in burrows and sometimes uses one that is occupied by a bird. Since the tuatara eats insects it may help to keep the nest clean and free from parasites, but as it also occasionally eats the eggs or young birds, the petrels gain little from the arrangement.

AMONG INSECTS AS WELL

Many large beetles become infested with tiny parasites called mites. This big South American beetle has mites on its body, under the wings; they can be seen in the picture on the left as small spots. But rather larger creatures called pseudoscorpions also live there, and these feed on the mites, to the obvious advantage of the beetle. Pseudoscorpions look rather like tiny scorpions, but lack the long tail with the sting at the end of it. They are not really insects, but arachnids, allied to scorpions and spiders.

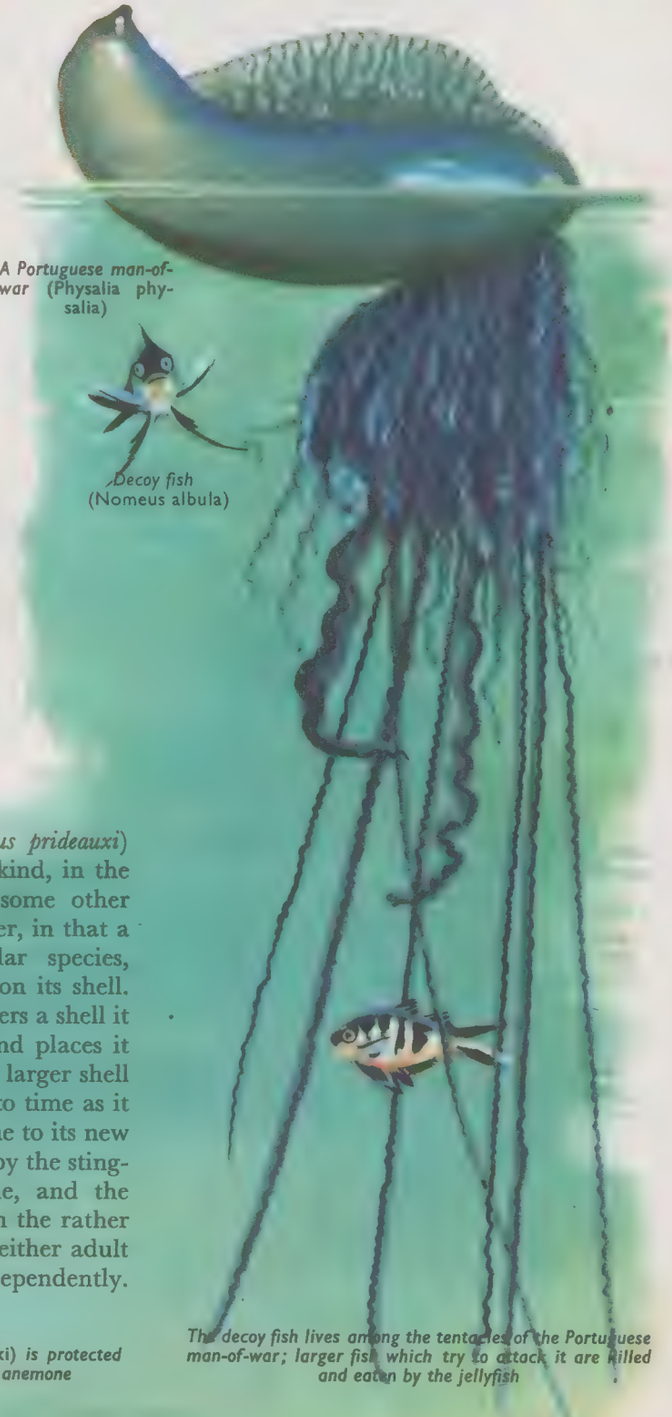
A South American beetle carries pseudo-scorpions under its wing-cases

SYMBIOSIS AMONG MARINE ANIMALS

Many striking cases of symbiosis are found among animals which live in the sea. On the coral reefs off the islands in the Indian Ocean lives a little crab called *Melia tesselata* which always carries a small sea anemone in each claw. It is supposed that the stinging cells of the anemone repel the crab's enemies, while the anemone finds an increased food supply by being constantly carried about.

The crab Melia tesselata, *which carries a sea anemone in each claw*

The Portuguese man-of-war (*Physalia physalia*) is a kind of jellyfish that floats about at the surface of the sea, supported by a bladder filled with gas. Its stinging tentacles are extremely poisonous and can quickly kill the fish on which it constantly preys. But among the tentacles lives a small fish called *Nomeus albula*, which is completely immune to them. These little fish seldom venture far from their refuge, where they are quite safe from attack by an enemy; it is possible that larger fish, pursuing the little *Nomeus*, are lured into the tentacles and devoured. For this reason *Nomeus* is called 'the decoy fish'.



The decoy fish lives among the tentacles of the Portuguese man-of-war; larger fish which try to attack it are killed and eaten by the jellyfish

The hermit crab (*Eupagurus prideauxi*) lives, like other crabs of this kind, in the empty shell of a whelk or some other mollusc. It is peculiar, however, in that a sea anemone of a particular species, *Adamsia palliata*, always lives on its shell. When the young crab first enters a shell it seeks out a small anemone and places it thereon; when it changes to a larger shell (which it must do from time to time as it grows) it transfers the anemone to its new abode. The crab is protected by the stinging tentacles of the anemone, and the latter picks up fragments from the rather untidy feeding of the crab. Neither adult species is ever found living independently.

The hermit crab (Eupagurus prideauxi) *is protected by the stinging tentacles of a sea anemone*

TARTANS

A Highlander in native dress (taken from a picture of 1570)

IN London, in May, the Caledonian Ball is held. Hundreds of Scottish families travel south to join with Scots in England in one of the most colourful English balls of the year. Many of the men wear full Highland evening dress, with kilts and sporrans; many of the women wear tartan sashes over their dresses. The whole effect is glamorous and gorgeous – but Englishmen, and probably many Scotsmen as well, do not always realise from what humble beginnings Scottish national dress has developed.

In the 11th century Highland clothes consisted of a short tunic of saffron-coloured linen, covered with a mantle, and sometimes worn with short trousers which left the rest of the leg bare. This style of dress was worn both in Scotland and Ireland for many centuries. An amazed French visitor wrote in 1556: 'They wear no clothes except their dyed shirts and a light woollen rug of several colours.' When the use of the saffron shirt, or *leine croich*, began to die out in Scotland at the end of the 16th century, more emphasis was laid on the mantle or plaid, which was made of tartan.

such definite associations did not yet exist. Tartan used to be woven at home by women using hand-looms. They wove the sett of their choice, following a special stick which had the coloured threads of the pattern wound round it in the correct order. Although clans did not at first have their individual tartans, setts sometimes became associated with certain districts and hence with the families that lived there.

As we have seen, the saffron shirt was superseded by the 'belted plaid', which was a forerunner of the modern kilt. It was made from two lengths of the woven tartan sewn together to form a rectangle. The wearer spread it on the ground, with a belt laid underneath. He lay down on top of the plaid, and did the belt up round his waist, gathering the plaid together. The bottom hung down to just above the knees, and the top fell loosely and could be worn over one shoulder or used as a cloak.

But there were disadvantages to the belted plaid. Because it was made in one piece it was inconvenient to remove it if part of it became wet. In battle it was heavy and cumbersome to wear, and was often discarded and lost.

Tartan trousers were also worn, particularly by those who rode on horseback,

How to put on a belted plaid: the wearer spreads it on the ground and lies on it. The lower half forms a skirt, while the rest of the material can either hang loose or be thrown over the shoulders

A Highlander wearing a belted plaid and trews

The development of tartan

The word 'tartan' is derived from the French *tartaine*, which was originally the name given to a certain kind of material, regardless of colour. The present meaning of tartan as a chequered material came later. All tartans have different patterns of colours, lines, and checks, known as *setts*. Today setts are known by the name of the clan, family, or regiment with which they are associated, but in the 16th century while women wore plaids, sometimes of silk, over their dresses. Although a few Lowland families wore tartan, until the beginning of the 18th century the Highland clans remained rather apart from the rest of Scotland, with their own customs, dress, and language.

The Jacobite unrest

Following the agitations of the Jacobite clans after 1688, the Act of Union incor-

Highland tartans: Dress MacLeod, Campbell of Argyll, and Grant; Lowland tartans: Lindsay, Bruce, and Gordon

porating the English and Scottish crowns into the United Kingdom was passed in 1707. This led to a wave of Scottish nationalism; tartan spread to the Lowlands and was regarded as national dress. In 1725 Marshal Wade was appointed to direct six Independent Companies of Highlanders who were to keep order in the part of the country from which they came. They wore as uniforms belted tartan plaids, and were known as the 'Black Watch'. In 1740 they became a regiment. Scarlet jackets were worn with the plaids, and a single tartan was designed as uniform, so that the soldiers, who had formerly worn their own regional setts, should now all wear the same tartan. This new tartan was known as the Black Watch or Government pattern, and was the first to have a specific name and origin. About this time the modern kilt or 'philabeg', with its obvious advantages, began to replace the belted plaid, and its use spread rapidly through the Highlands.

In 1747, in an attempt to curb rebellious national feeling, the Dress Act was passed making it illegal to wear Highland clothes, or any garment made of tartan. The penalty for infringement was six months in prison, and for a second offence transportation. During that time tartan could only legally be worn in the Army, where distinct regimental setts were gradually established, most of which were derived from the Black Watch tartan. By the mid-19th century there was a widespread adoption of the kilt or tartan trews – narrow trousers unlike 17th-century tartan trousers – by both Highland and Lowland regiments.

A private of the Black Watch today

The revival of tartan

The Dress Act was repealed in 1783. During the years it had been in force, the Highlands had been greatly depopulated and many of the original district setts had been forgotten. But national pride and a romantic interest in Scotland, fostered by the novels of Sir Walter Scott (see page 293), had remained. In 1822 King George IV visited Scotland and held a levee at Holyrood at which he appeared resplendent in a kilt of the Royal Stewart tartan.

The cult of the family tartan was now established. In 1831 a book called *The Scottish Gael* was published, describing 55 different setts. Another book, *The Vestarium Scoticum*, came out a few years later, illustrating 75 different setts, but there was no proof that they were all authentic. As more and more clans and families claimed tartans, more setts were copied or invented by the manufacturers.

By the time Queen Victoria bought Balmoral in 1852 the respectability of clan tartans was assured. She and the Prince Consort had a passion for everything Scottish, and made liberal use of tartan in the interior decoration of the new castle. Carpets, curtains, even chairs and sofas of Royal and Dress Stewart tartan were commissioned, and were described by an amazed lady-in-waiting as 'All highly characteristic, but not all equally *flatteuse* to the eye'.

In Scotland today tartan, largely in the form of a kilt and plain jacket for the men and a skirt for the women, is worn by both Highland and Lowland families. The more sombre Hunting tartans are worn every day, and the Dress tartans for more elaborate or formal occasions. Strictly speaking, only those people with a family sett can claim a historical right to wear tartan, but if some of the claims are rather slender, at least the spirit of Scottish nationalism is kept alive.

A modern laird, wearing a Cameron of Lochiel kilt, and Cameron of Erracht plaid

A 16th-century able-bodied vagrant whipped till his back be bloody'

THE POOR LAW

TODAY in Britain nobody can be so poor that they starve – the Welfare State looks after them. But the British government is less trusting than it was; it used to feel able to leave the care of less fortunate members of society to the charity of private individuals. In fact, it was so trusting that for hundreds of years it did not pass one single Act to provide money, food, clothing, or housing for those who were too old or too feeble to look after themselves.

This attitude lasted until the 16th century. Up till then poor relief had been in the hands of benevolent landowners and, above all, the monasteries.

In times of great distress the monasteries would be unable (or occasionally even unwilling) to provide for all those who clamoured for food, while many landowners were anything but benevolent. But this was not the concern of the government. In the Middle Ages it was considered to be a Christian's duty to help those who were not so well off. Charity depended on the charitable.

Chaos in the 16th century

Under the feudal system everyone had occupied tracts of land which they held directly from their feudal superiors. Thus, while peasants were extremely poor, they could at least grow enough food to keep themselves alive. But in the 16th century a new phenomenon appeared in English society – large-scale unemployment of people no longer tied to the soil. The Dissolution of the Monasteries between 1536 and 1540 added further to the chaos.

It was in the changing society of Tudor England that the first Poor Law was born. It was passed in 1531, and was one of the most stupid social laws ever passed by an English government. It stated that certain aged and impotent persons might be licensed to beg, but those who were not aged or impotent but simply out of work (the so-called 'sturdy rogues and vagabonds') were to be 'tied to the end of a cart naked and beaten with whips throughout the same town or other place till his or her body be bloody by reason of such whipping'.

This Act failed to distinguish between those who were physically unable to work, those who were unable to find work, and those who were too lazy to do so. The next Poor Law of 1536 was a great improvement. This ordered the parishes to find work for the able-bodied, and to organise collections for the aged and infirm.

Even so, relief was still confined to voluntary charity. The big advance came in 1547 when London tried the experiment of levying a compulsory tax or *poor rate* to provide funds for relief. An Act of 1572 authorised all parishes to levy the poor rate.

All previous legislation was consolidated by two major Acts of Queen Elizabeth in 1598 and 1601. These were known collectively as the Old Poor Law, and they laid down principles that were to dominate the English poor legislation for 200 years. The able-bodied poor were to be 'set on work' in Houses of Correction, which were to keep a stock of tools and materials for this purpose. The compulsory poor rate was to provide funds for the aged and infirm, and the task of administration was given to parishes who each year were to elect overseers to supervise the working of the Poor Law.

The Tudors took a great interest in the workings of their Poor Law, and so too did the early Stuarts. But after the Restoration of Charles II in 1660, the government began to leave the Poor Law more and more to the control of parishes. The parishes were helped by the *Law of Settlement and Removal* of 1662 which enabled them simply to expel any pauper who applied for relief, or was caught begging before he had lived in the particular parish for 40 days or more.

A beggar unfit for whipping confined to the stocks. The stocks remained a punishment under British law until the mid-nineteenth century

The conditions of the poor varied greatly from parish to parish. In some parishes 'workhouses' were set up to provide work for the able-bodied; but these degenerated into clearing houses where all paupers, able-bodied men, women, and children, were herded together with the old and crippled. Nevertheless they were successful to such an extent that in 1723 the government passed an Act encouraging all parishes to set up workhouses. There was still no uniformity in the English Poor Law, and the workhouses existed side by side with other methods of providing relief. It was in 1795 that the little village of Speen in Berkshire began an all-important experiment. It fixed a minimum wage which everyone should be able to earn. It provided this sum for paupers, and made up low wages to the same figure. This *Speenhamland system* caught on in many parts of the country, but employers used it as an excuse to give deliberately low wages, which were then made up out of public funds. It was degrading for a worker not to be able to earn a living wage, and clearly something had to be done. In 1834 a new Poor Law was enacted on principles laid down by the great social reformer Edwin Chadwick. All the poor were to go into workhouses which were to be run on the *principle of lesser eligibility* – that is, conditions were to be more unpleasant than those of the humblest free labourer. They were. People accepted a wage of 5*s*. a week to stay out of the workhouses. Conditions were frightful; the hours were long, the work was hard and the food a kind of gruel made from sulphur. Novelists such as Dickens in *Oliver Twist* were able to paint their frightening pictures of workhouse life. The workhouses were administered by 'unions' of parishes under Boards of Guardians. These Boards of Guardians were responsible to a three-man Poor Law Commission headed by Chadwick himself.

Workhouse in St James' parish. The principle of lesser eligibility *made the inmates' lives a misery*

Perhaps the worst thing about the 19th-century system was that poverty was regarded as a crime. Paupers were housed in special places, and wore a distinctive uniform just like imprisoned criminals. Above all, they were excluded from the basic right of citizenship – the right to vote – and were not allowed to do so until 1918. But towards the end of the century workhouse conditions were reviewed; food, lighting, and sanitation were all improved, largely as a result of pressure from the working classes, who were given the vote in 1884. Indeed the whole question of poor relief was being overhauled, with the result that, although it remained, the functions of the Poor Law were being assumed by other bodies. Between 1909 and 1911 Lloyd George introduced a number of laws in which he placed poor relief in the hands of specialist departments. Unemployment benefits, National Insurance to provide help for the sick, and labour exchanges were all introduced.

It was in the 'great depression' of the 1920's and 30's that England was hit by the greatest economic crisis of her history. At times one in five of the working population were without jobs. The labour exchanges and insurance schemes proved unable to cope with the unprecedented distress, as did the Poor Law itself. The Boards of Guardians were inundated with requests for assistance which they proved totally unable to meet. In 1929 they were abolished and the Poor Law placed in the hands of local authorities as a Royal Commission had suggested as long ago as 1909. Unemployment and distress still increased, and in 1934 a new board, the *Unemployment Assistance Board*, was set up, bringing unemployment benefit wholly into the hands of the central government.

Edwin Chadwick (1800–1890)

During the Second World War there was virtually no unemployment, and the administration of all forms of pauperism, including old age and infirmity, came under the Unemployment Assistance Board. In 1940 it dropped the 'Unemployment' from its title and, following the recommendations of Lord Beveridge, became in 1948 the *National Assistance Board*, under the terms of the *National Assistance Act*.

This is the system in force today. Every member of the community pays in taxes for the funds distributed by the National Assistance Board. So charity is today the collective responsibility of everyone in the Welfare State.

Leicester Square soup kitchen, Adam Yard, Windmill Street; one of the ways in which 19th-century poor were assisted

HOVERCRAFT

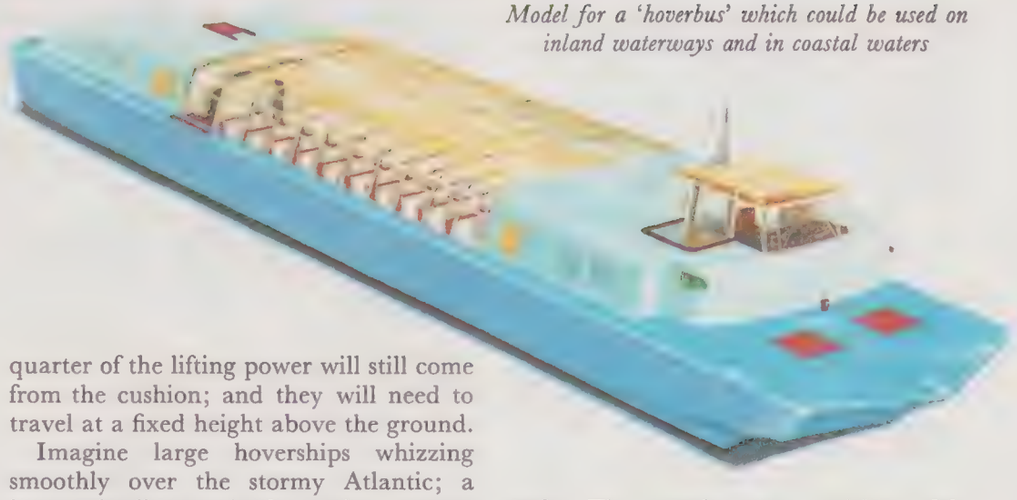
IT does not fly and it does not float; it has no wheels or wings. It travels through the air, but it is not an aircraft; it travels over water, but it is not a ship. In fact, a hovercraft might be called a cross between a ship and an aeroplane, but unlike them it stays at a constant height in relation to the surface above which it travels. And this surface can be solid like land, or liquid like water.

The principle on which a hovercraft works is quite simple. It moves along on a 'cushion' of air. This cushion is prevented from escaping by downward jets of air which form invisible 'curtains' all round it. Once the craft has risen off the surface, it is moved along by propellers which are driven by the same engines that make the air cushion.

Some of the more recently designed hovercraft have sidewalls to hold the air cushion in place, but a certain amount of air 'curtaining' is necessary to replace any losses from the cushion.

In time, no doubt, there will be almost as many kinds of hovercraft as there are wheeled vehicles, for the possibilities are enormous. They will range from those like the basic hovercraft, which are completely cushion-borne at their cruising speed, to those like aircraft, being three-quarters airborne and with a much higher cruising speed. But these will still be essentially hovercraft, since one-quarter of the lifting power will still come from the cushion; and they will need to travel at a fixed height above the ground.

Christopher Cockerell, inventor of the hovercraft principle, with one of his first models. For its tests it was tethered to a stake, and proved able to support itself 2 inches above ground or water. Power came from a model-aeroplane engine which was mounted at the fin. With the help of such models Cockerell, who was himself a boat-builder, was able to convince engineers that his theory would work



Model for a 'hoverbus' which could be used on inland waterways and in coastal waters

Imagine large hoverships whizzing smoothly over the stormy Atlantic; a hover wheelbarrow in the garden; or even hover-punting to school! Perhaps the railways may even be replaced by hover-trains over the same routes as the present tracks.

The advantage of freeing a vehicle from contact with the surface over which it is travelling is that the mechanical friction is removed, and so the thrust of the propulsion unit is that much more effective. In the example of the hovercraft which is still almost a ship, the speed could be between 20 and 40 knots, or between 23 and 46 miles an hour. A hovercraft which is virtually airborne could travel at about 200 knots, or 230 miles an hour.

Early history

The story of the development of hovercraft is the story of an entirely British achievement. In 1953 a Norfolk boat-builder, Mr Christopher Sidney Cockerell, started thinking about how he could reduce the friction of water on his boats. He realised that if the drag of the water on a boat's hull could be reduced, it would go faster and more efficiently.

He began experimenting with a captive air bubble, and by the summer of 1955 he had proved to his own satisfaction that his idea really would work. He tried to interest various shipping and aircraft companies in his theory, but none of them thought it practicable. It was not until 1957, when he had made a working model of his own, that he found people who were interested. Experts from the Admiralty and the Ministry of Supply realised that here was an entirely new principle of transport which deserved to be treated seriously.

The Aircraft Research branch of the Ministry of Supply sponsored a programme of research carried out by the Saunders-Roe Division of Westland Aircraft. The result was exciting: Mr Cockerell's theory was right. Although a lot of research still had to be done, it was obvious that here was a revolutionary new vehicle.

Development was now taken over by the National Research Development Council – a government body which sponsors British inventions. A company was formed called Hovercraft Development Ltd, and plans were made to establish an entirely new industry. One of the advantages of this scheme was that all the development was centrally organised. The firms which started work on the different kinds of hovercraft operated under licence from Hovercraft Development Ltd. This meant that effort was not duplicated and research could go on into all the different applications of the hovercraft principle.

First model

The first manned experimental hovercraft to be built was the S R N 1. It was oval in shape and about 30 feet long and 24 feet

An experimental 'hover-stretcher' which would mean a smoother ride for casualties over rough ground

wide. It had a 435-horsepower engine and operated at a height of 1 foot above the surface. Although no provision was made at first for carrying passengers or freight, it could carry 20 people on the deck as well as its crew of two. When the craft was loaded like this the 'hoverheight' was reduced by about 4 inches.

Only 11 days after its first 'hover' on 11th June 1959, S R N 1 was taken across the Solent and up on to the beach.

Next month, on 25th July, it crossed the Channel from Calais to Dover. This took just over two hours, for the craft met strong headwinds which reduced its speed.

In the spring of 1960 work started on S R N 2, the first really practical passenger-carrying hovercraft. Already in operation, the S R N 2 is still regarded as an experimental craft for testing and proving the power units, transmission, and fans for a later generation of still larger craft. The S R N 2 itself can carry 66 passengers and travels at a height of about 4 to 5 feet. The S R N 2 Mark 2 has already been designed, and will carry 120 passengers.

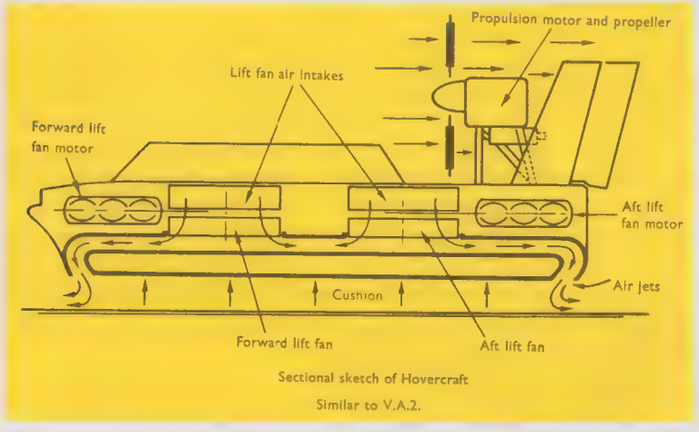
The S R N 2, the first really practical passenger-carrying hovercraft. The next stage of development will probably be a craft capable of carrying 120 passengers. Within ten years it is quite likely that a craft will have been built which can cross the Atlantic in 24 hours at a speed of 125 knots

Possibilities for the future

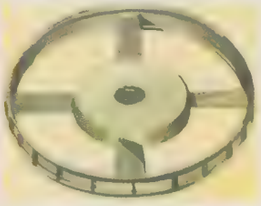
Now that it has proved feasible to build and operate hovercraft on a large freight- and passenger-carrying scale, a cross-Channel hovercraft ferry service is a definite possibility. Two large hovercraft could provide a half-hourly service between Britain and France. They would need no harbour or docking arrangements, for they could run straight up on to the beach.

Hovercraft Development Ltd is also thinking of trying out a 'hovercar' which would travel at high speed over some sort of track, and which could be used for inter-city transport. It would be rather like a monorail, but with an air cushion instead of wheels.

Another possibility is to apply the hovercraft principle to help support an aircraft at take-off or landing. Hovercraft for snow and ice, and for sand and swamp, are all being developed.



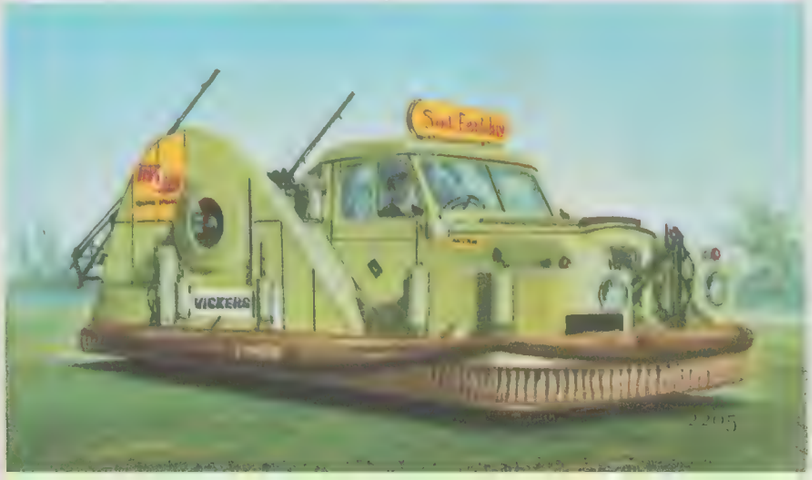
The principle on which a hovercraft works is shown in this diagram. Downward jets of air form an air 'cushion' which is prevented from escaping by a 'curtain' of air, also made by downward jets. The craft is propelled by conventional airscrews or gas turbines. As the size of the craft increases the power per ton needed to lift it grows less. A hovercraft of 400 tons requires only a quarter of the power per ton needed by an aircraft of the same size, but can carry twice the payload



Fans like this one provide the lift in basic hovercraft. In the S R N 2 there are two of these lifting fans and two propulsion airscrews

The C C-2 Cushioncraft works on a standard car-type engine. Lightly laden, it has a 'hoverheight' of about 2 feet

A Hovertruck designed for agricultural use. The air cushion is held by a 'skirt'



MARCONI

Guglielmo Marconi (1874–1937)

ON a stormy December day in 1901 a group of men sat tensely, waiting in a barracks in St John's, Newfoundland. A shy, dignified young man was sitting at a table on which was some electrical apparatus. He was wearing headphones and straining to catch a sound above the roar of the gale.

Suddenly it came, the noise they had been waiting for: three faint clicks in the headphones, the dot-dot-dot of the Morse letter 's'. The clicks had come from Cornwall, over 2,000 miles away. The man wearing the headphones was Guglielmo Marconi, who had just achieved a sensational advance in the development of communications.

The beginnings of radio communication

Nowadays people take wireless, or radio as it is generally known, very much for granted. But in Marconi's day few believed it would ever be very important. Many scientists before Marconi had worked on the basic idea, including Michael Faraday, James Clerk Maxwell, and Heinrich Hertz. Maxwell had studied *electromagnetic* waves (waves made up of electric and magnetic forces) and had foretold that these waves would be able to be sent through space, and detected at a distant place without any wires joining the sending apparatus to the receiving apparatus. Because of the lack of connecting wires the waves came to be called wireless waves.

Hertz sent the first wireless waves through space in his laboratory in 1887. But no one at this time saw any practical use for this discovery. Marconi realised that these waves could be used as a means of communication, and it was his stubborn belief in his theory, his financial flair, his inventive genius, and his capacity for hard work that brought his great dream of communication through wireless waves into being.

A schoolboy scientist

Marconi was born on 25th April 1874, in Bologna, Italy. His Italian father was a well-to-do businessman, and his mother was an Irishwoman, who taught her son to speak English at an early age. This was later a great help to him. He was a delicate child, whose favourite occupation was reading the books in his father's scientific library. He went to school first in Florence, then in Leghorn, and soon developed a passion for electricity. His interest in science was so great that his mother arranged for him to have special lessons from a physics teacher at the University of Bologna. Marconi set up a laboratory in the attic of his home, where he did electrical experiments with accumulators, bells, and yards of copper wire.

When Marconi was 20 he read about Hertz's experiments with wireless waves. Inspired by this, he set to work, and the next spring, when he was just 21, the wireless telegraph was born. From a transmitter in the attic Marconi sent the Morse letter 's' by wireless to a receiver in his garden.

Later Marconi developed his *aerial-earth* system, (still in use today) which strengthened his signals so that he could send them over several miles.

Marconi's yacht Elettra, *which he fitted out as a floating laboratory. On the right is shown part of the specially fitted cabin*

Marconi experiments in the attic laboratory of his home. His early experiments led to sound broadcasting as we know it today

Marconi now tried to interest the Italian government in his invention. But they showed no enthusiasm and, encouraged by his mother, Marconi came to London in 1896. Here he was luckier. The British Post Office offered him help and Marconi filed his first patent, protecting his invention, in June 1896. The next year, using balloons and kites to increase the height of his aerial, he gave several successful demonstrations, sending signals nearly 9 miles across the Bristol Channel. He steadily improved his apparatus, and, although many people still scoffed at his ideas, he set up a company with the help of an engineer cousin. In 1899 a wireless station was established at South Foreland which was able to communicate with Wimereux in France, some 31 miles away, while British battleships, equipped with Marconi's apparatus, exchanged messages over distances of 75 miles. In September of that year two ships were equipped by Marconi to report to newspapers in New York on the yacht race for the America's Cup – this aroused interest all over the world. The next year a company was formed by Marconi for the installation and operation of services between ships and land stations. In that same year he filed his famous patent No. 7777, for his improvements in tuning wireless transmitters and receivers.

Transatlantic communication

A great problem now had to be overcome. Wireless communication over comparatively short distances had proved a success; could it also succeed between places thousands of miles apart? There were many technical difficulties, but by 1901 Marconi hoped he had found an answer to the problem. He set up a transmitting station at Poldhu in Cornwall, and sailed to Newfoundland, where he built his receiving station near St John's. Amid fierce gales he flew his aerial on a kite, and just after noon on 12th December he heard the clicks that proved that communication was possible between any two places on earth. This event was the start of the enormous expansion in wireless communications that took place in the next half-century. It aroused world-wide interest, and from that time on steady advances were made.

In 1904 Marconi set up a news service by wireless between England and the United States, and a few years later a public service was opened as well. In 1912 the liner *Titanic* was wrecked on an iceberg during her maiden voyage. She was equipped with radio, and her distress signals brought help much more quickly than earlier methods could have done. Another event that brought wireless communication into the news was the arrest of the murderer H. H. Crippen, who was recognised on board a ship sailing from England to Canada. The news was telegraphed to shore, and when the ship docked Crippen was arrested.

Speaking across space

So far, all Marconi's communication through wireless had taken place in Morse code; he was determined to send voices and music through the air in just the same way. He experimented continuously, and in about 1914, with the aid of the Fleming thermionic valve, he managed to speak over the air. In 1919 spoken words were broadcast between Ireland and America; the Marconi company started broadcasting from Chelmsford in Britain in 1920, and public broadcasting soon spread to many countries.

Honours and rewards

During his life Marconi was honoured in all parts of the world. In 1909 he won the Nobel Prize for physics. In 1929 he received the title of *marchese* (marquis) and was nominated to the Italian senate. He was honoured by many scientific associations. He died in Rome on 20th July 1937, and was given a state funeral by the Italian Government.

MOROCCO - history

IT was not until the end of the 19th century that the great European powers, anxious to extend their empires, began to take an interest in the affairs of Morocco. France finally got most of it – but only at the expense of giving Britain a free hand in Egypt, Germany a large slice of Equatorial Africa, and Spain a small slice of Morocco itself. The empire which France took over in 1912 had had over a thousand years of independent history – it was founded before both the Kingdom of France and the Holy Roman Empire, and lasted longer than either of them. But its history was distinguished by few great achievements. While Europe changed from feudalism to industrialisation, Morocco remained 'a feudal slum' which at the end of the 19th century had neither bridges nor railways – and a Sultan with only very limited power.

The empire emerges

The Moroccan empire began with the splintering of the great Arab empire which at one time stretched across North Africa into Europe. In A D 788 a descendant of the Prophet Mahomet, Idris, set up an empire of his own based on the Roman Imperial Province of Mauritania. From then on a succession of Muslim dynasties ruled over the area.

Under the rule of the Almoravides, a fierce tribe of Berbers from the Atlas mountains, the Moroccan empire stretched from the Atlantic coast of Africa to Tripoli. But with the breakaway of Tunis (see page 2144) Morocco began to take on the boundaries which it has today.

Muslim Morocco

In the 15th and 16th centuries the Spanish and Portuguese arrived in Morocco and took over the Atlantic ports. In the second half of the 16th century there was a religious revival in Morocco led by Arab descendants of the Prophet Mahomet, known as the Sherifs, who succeeded in driving out the Spanish and Portuguese.

In 1668 a new dynasty came to power in Morocco. Its members were also descendants of Mahomet but of mixed Arab descent; this family still rules Morocco today. The most famous early member of this dynasty was Sultan Moulay Ismail, a contemporary of Louis XIV, whom Moulay tried to imitate. He set out to build at Meknes, near Fez, a palace

The magnificent gate to the Kasbah at Rabat, which was built in the 12th century under the Berber, Sultan Abd al Mumin

that would completely outshine Versailles. The royal stables alone were 3 miles long, and contained 12,000 horses. Moulay is said to have had over 500 wives, and in one period of six weeks 31 children were born to him. In his lifetime, Moulay is supposed to have killed 36,000 people. But despite his barbaric character Moulay proved to be a competent ruler, and under him Morocco had one of its rare periods of peace and prosperity. After his death in 1727 the country went downhill. In the next century the great European powers began to take an interest in North Africa. In 1870 Morocco's Sultan saw the 'writing on the wall', and appealed to the United States to establish a protectorate over the country, so that Morocco would not be taken over by European powers.

French Morocco

But, as we have seen, this was not successful, and in 1912 Morocco was taken over by the French, who began to rule in the Sultan's name. Moroccans were extremely lucky in their first French Governor-General, Marshal Louis Lyautey, who, more than anyone, was the founder of modern Morocco. During his period of office from 1912 to 1925 new roads, hospitals, and schools were built; and the unruly hill tribes were subdued. The Arabs in the towns respected Lyautey, for he did his best not to offend their susceptibilities. He built new cities, including Casablanca and Rabat (over an ancient Arab settlement), which is now the capital of Morocco.

Independence and unity

In 1934 the nationalist movement which led to Morocco's independence began. In this year the new Moroccan Committee of Action, whose aim was to limit the French protectorate, was set up. From then on the movement for independence grew, though during the Second World War, under the Vichy regime, the nationalists did not actively oppose the government. By 1950 agitation for independence had reached its height. The nationalist movement, organised by the Istiqlal (independence) party, was led by the dynamic Sultan Sidi Mahomet Ben Yussef. Matters, however, were complicated by the rivalry between the Arabs and the Berbers in Morocco – El Glaoui, Pasha (a sort of lord) of Marrakesh, and leader of the Berber chiefs, supported the French. In 1953 the French managed to remove Ben Yussef from power, and replace him as Sultan by a more amenable relative. But growing unrest forced them to recall Ben Yussef, who in 1955 returned to Morocco. In 1956 Morocco was formally declared independent; soon afterwards Spanish Morocco, and the internationally controlled town of Tangier, were added to its territory. So in 1956 a unified Morocco entered the United Nations.

In 1957 Ben Yussef renounced the title of Sultan for that of King; he had previously renounced his absolute power, so Morocco is now a constitutional monarchy. In 1961 Ben Yussef died, and was succeeded by the Crown Prince, who became King Hassan II. Today, Morocco is one of the uncommitted nations of the world.

'One of the most dangerous sports in the world.' This is how motor racing has often been described. Nevertheless each year the competition becomes fiercer for its top prizes – the Grands Prix. Throughout the history of motor racing different countries have dominated Grand Prix competitions. Today Britain is riding on the crest of the wave. In fact at this moment . . .

Clark

BRITANNIA RULES THE TRACKS

LAST month a 26-year-old sheep farmer roared to victory in the British Grand Prix at Silverstone. This talented young man was Jim Clark, and it was his fourth successive victory. It convinced the British crowd of 115,000 that Britain had found yet another

Moss

brilliant driver. And it seems certain that soon the World Championship, a point competition based on the major races, will fall to Clark – last year he came second to Graham Hill.

There can be no doubt that Britain leads the world in Grand Prix racing. Today Britain has both the best cars and the best drivers. But this is only a fairly recent development which began in 1957 when Stirling Moss, one of the greatest drivers of modern times until his tragic accident, won the British Grand Prix at Aintree, driving a Vanwall. It was the first time that a British car had ever won the British Grand Prix.

The start of this year's British Grand Prix at Silverstone.

The following year saw a tremendous battle between Moss and Mike Hawthorn for the World Championship. Hawthorn, who was later killed in a road accident near Guildford, won it from Moss by one point to become the first ever British World Champion. The outcome was in the balance until the last race of the year – the closest fought finish in the history of the Championship.

By 1960 Britain was way ahead of her rivals in the world of motor racing. She provided both the fastest cars and the fastest drivers, and the year was rounded off in great style when the last World Championship event – the American Grand Prix at Sebring – was won by Moss driving a Lotus.

And today our own racing circuits like Aintree, Silverstone, and

Hawthorn

Brand's Hatch are drawing increasingly large crowds, for the public are quick to recognise that they are seeing the very best in international racing.

The repeated success of the youthful Clark, who seems to have the same natural flair and dash as Moss, means that Britain will probably dominate Grand Prix racing for some time to come.

GRAND PRIX

The Grands Prix are the most important races for racing cars as opposed to saloon or sports cars. Cars competing are Formula 1 cars which have an engine capacity of between 1,300 and 1,500 c.c. Among the most famous Grands Prix are the French, held at either Rheims or Rouen; the Italian, held at Monza, where there is a four-mile course with banked corners; the Grand Prix of Monaco, run at Monte Carlo; and the British Grand Prix, run at Silverstone or Aintree.

RACING COLOURS

In international racing the cars have different colours according to which country they come from. British cars are green, French blue, German white, Belgian yellow, Italian red, and so on.

THE CARS AND THEIR DRIVERS

Here are some of the leading Grand Prix makes together with the men who pilot them

LOTUS

At the moment the Lotus, powered by the V8 Coventry Climax engine, is the world's outstanding Grand Prix car. Jim Clark won the British Grand Prix in one.

BRM

Hill

When first introduced, the BRM became a music-hall joke because of its failures. However, in 1962 it won the World's Constructors' Championship for itself, and World Championship for its leading driver, Graham Hill.

BRABHAM

Brabham

After winning the World Championship twice with the Coopers, Jack Brabham went into business on his own. His new car, the Brabham, appeared in 1962 and shows promise of being a potential Grand Prix winner.

FERRARI

At one time the Italian Ferrari completely dominated international motor racing. Recently it has been somewhat eclipsed, although John Surtees finished first in a Ferrari in the German Grand Prix.

COOPER

The Cooper is a reliable car, not as fast as some of its rivals. Piloted by Bruce McLaren and Tony Maggs it should do well in this year's Championship, but through consistent placings rather than outright wins.

BIG MONEY AND LONG JOURNEYS

A top racing driver can earn anything between £15,000 and £30,000 a year. Much of this comes from starting money, which is usually shared fifty-fifty with the organisation that has entered the car. The top teams like BRM, Lotus, and Cooper get £1,000 for entering their first car, and £900 for the second. Jim Clark probably made about £2,000 out of the British Grand Prix. This included starting money, prize money, and other bonuses from the fuel companies and accessory firms to which he is contracted.

The distance a Grand Prix driver travels is fantastic. Last year's champion, Graham Hill, estimates that he travels at least 100,000 miles in the year. For instance, last January he flew from South Africa to New Zealand to drive in the Grand Prix at Auckland.

You write – thousands read!

Upside-down Tree

DEAR EDITOR—In *Knowledge* No. 75 you showed a picture of a baobab tree. I saw these trees in Rhodesia, and heard many legends about them. Some Africans believe that the gods became angry with the baobabs for being so proud, and punished them by turning them upside down. That is why the baobab tree, with its few, thick branches, looks as though its roots are in the air.

Karen Vandenberg (age 9),
Elmstead,
East Cholderton,
Andover, Hampshire.

The Voice of the Gods

DEAR EDITOR—I went to Malta for my holidays, and visited many temples and historical places.

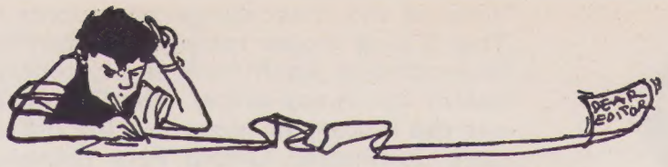
At the Oracle at Farxien there are long, flat stones with carvings symbolising the eternity of life. There was also a stone screen which the priest stood behind to listen to the questions of the worshippers.

In places there are two round holes in the wall about six inches apart which held the ropes binding a sacrificial beast.

At the Hypogeum, an underground temple, winding steps lead down into the rock, ending in an enormous cavern with smooth walls, divided up into sections. In one, the worshipper would ask a question. In the next 'room' the priest would put his head into a round hole in the rock and answer so that a great booming sound was carried round the room and through a hole into the worshipper's room. I tried this, and it sounds like the voice of the mighty gods. An archaeologist did this once and the noise was so terrible that he rushed out of the temple and would not go back for three days.

Another ingenious thing is the treasury. If you were a robber long ago, you would go down the steps to the treasury in pitch darkness, and fall into the deep pit at the bottom. As the priests went down, however, they would count the steps and at the seventh (seven was always a mystic number) climb onto a narrow ledge that circled the pit and then jump onto a platform on the other side. The treasury and granary were 40 feet below the ground.

Timothy Richards (age 11),
13 Kensington Court Place,
London W.8.



Nessie Sighted Again

DEAR EDITOR—The Loch Ness monster has been seen again. In my local paper, dated 10th July, there is an account of the monster being seen by four men working on a house near the loch. For six to eight minutes they watched 'Nessie' cover about three-quarters of a mile at a fair speed, popping up, diving and reappearing.

They described the monster as having a black hump, about 30 feet long and 8 feet high above the water. Thirty to 40 feet behind this hump was another large disturbance in the water.

I think that Nessie is a kind of plesiosaur that has adapted itself to suit the conditions in Loch Ness.

Ian Greig,
1 Saggar Street,
Dundee, Scotland.

More Money

DEAR EDITOR—I would like to follow up Judith Lipman's letter about early Australian currency (*Knowledge News*, 17th February 1963). Another form of currency widely used was that of promissory notes or I O U's. In the early days of Australia's history there was only a limited supply of coins available and these notes were used instead.

There were many disadvantages, at least to the honest citizen. Anyone and everyone, from the Governor to a convict, would issue them. They were forged, issued under fictitious names or without collateral (that is, with no money to back them). Accepting these promissory notes was therefore not without risk. Storekeepers would accept them at a discount, or for less than their face value, in the hope of offsetting any possible loss.

There were unscrupulous men in the settlement who took advantage of this practice. Governor Macquarie, in a dispatch to England, described a case where a man issued notes for a considerable amount while purchasing goods. He then circulated a rumour that his financial position was unsound; such rumours, even today, travel with amazing speed, and this one was soon known by all the tradesmen, who rushed to get rid of the notes at whatever price could be obtained. In such circumstances there would be few buyers. So the issuer's agent was able to buy them back at as little as 25 per cent of their face value, ensuring a handsome profit on the goods originally purchased.

These notes were finally stopped by Governor Macquarie with the founding of the Bank of New South Wales in 1817.

I would also like to say that I am forming a stamp club. Collectors from all countries are welcome to join.

Alan Blackman,
23 Halliday Street,
Mount Waverley,
Melbourne, Victoria,
Australia.

Land of Peace

DEAR EDITOR—I live in the peaceful country of Malaya. Three-quarters of the world's natural rubber grows here and we have also a number of tin mines. In my country all nationalities, Malays, Chinese, Indians and Europeans, live together. Although Islam is the main religion, religious freedom is given to all.

The three most important ports in Malaya are Singapore, Penang and Port Swettenham. Malacca is a famous city that was an important port many centuries ago.

S. Haroon Rashid,
Stalk Surau Arab,
Jalan Engan,
Batu Pahat,
Johore, Malaya.

No Graveyard

DEAR EDITOR—Another reason why no elephants' graveyards have ever been found was given in an article by a big-game hunter recently. He described seeing two porcupines gnaw a 90-pound tusk down to a stump of only five pounds.

Paul Sharrad,
Taurama Barracks,
Port Moresby, Papua.

How much do you know about explorers?

1. Who reached the South Pole before Scott?
2. News of what successful expedition reached Britain just at the time of the coronation of Queen Elizabeth II?
3. Which 'Passage' was Sir John Franklin seeking when he was lost – the North-East or North-West?
4. Where did Sir Ernest Shackleton die?
5. David Livingstone was an explorer as well as missionary and doctor. In what part of the world?
6. What did Speke and Grant discover?
7. Captain Bligh not only commanded the mutinous *Bounty*. He had previously sailed with the greatest explorer of his day. Who was he?
8. Columbus was an Italian, but the rulers of which country sponsored his voyages?
9. Who commanded these vessels: *The Golden Hind*; *Terra Nova*; *Destiny*; *Santa Maria*?
10. What 13th-century Venetian traveller led east until he reached the court of Kubla Khan?
11. Of what was the *Kon-Tiki* made?
12. What were Mallory and Irvine trying to do when they were lost on a famous expedition?

ANSWERS

1. *Amundsen.*
2. *The conquest of Everest by Sir John Hunt's party.*
3. *North-West.*
4. *Off South Georgia in the South Atlantic.*
5. *Central Africa.*
6. *One of the main sources of the Nile.*
7. *Captain James Cook.*
8. *Spain (Ferdinand and Isabella).*
9. *Sir Francis Drake; Captain Scott; Sir Walter Raleigh; Christopher Columbus.*
10. *Marco Polo.*
11. *Balsa wood.*
12. *To reach the top of Mount Everest.*

BRAIN ? BOX

1. Young George was just at the stage when he took his score-book to cricket matches and used it for every ball bowled.

   Recently, he was rather mystified when comparing the scores as given in the paper next day with what he had down in his book.

   'Look, Dad, there were seven no-balls bowled yesterday at the county match. I've got them all down. But it shows only three among the extras in the paper. I cannot account for it.' Can you?

2. —— and —— are two well-known seaside resorts in the same county of England and only a few miles apart. The former has eight letters and the latter seven. All the seven letters of the second word are in the first, one new letter only being added. What are the two places?

3. Mr and Mrs Robinson noticed a strange thing about their ages the other day.

   If you take the digits of Mr Robinson's age and multiply them, then add all the digits together (i.e. those of his age and those of the answer when they are multiplied), the result will be 10.

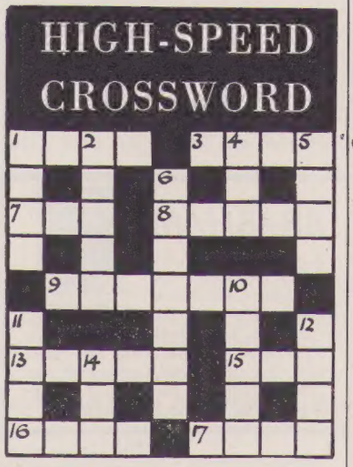
   Mrs Robinson is younger than her husband. Yet if you go through the same process with the digits of her age the result will also be 10.

   How old are they?

ANSWERS

1. *No-balls count as extras only if no runs from the bat result. Four of George's 'no-balls' must have led to scoring shots.*
2. *Ramsgate and Margate.*
3. *43 and 34.*

HIGH-SPEED CROSSWORD



Clues Across

1. Oblong hempen bag (4).
3. First man in the Bible (4).
7. River of Hereford (3).
8. Mountain ash with scarlet berry (5).
9. Legs for collapsible table (7).
13. Little rodent (5).
15. Slippery fish (3).
16. Often eleven in number (4).
17. See (4).

Clues Down

1. Scattered (as seed) (4).
2. Plain (5).
4. Morning moisture (3).
5. Coin factory (4).
6. Three stood on Calvary (7).
10. Great Yorkshire city (5).
11. Send out (4).
12. Kill (4).
14. Heroine of Spenser's great poem (3).

Solution next week

SOLUTION TO LAST WEEK'S CROSSWORD

ACROSS: 1, History; 5, Stirred; 7, Leo; 8, Dry; 9, Pen; 10, Ode; 12, Ant; 13, Scrooge; 14, Bondage.

DOWN: 2, Into; 3, Torpedoed; 4, Reed; 5, Seeds; 6, Drone; 11, Echo; 12, Agog.

ARMAND DENIS IS COMING

Don't miss his exciting lectures about wild life and primitive peoples. This week he is visiting the following towns: BIRMINGHAM on Friday 30th August, at the Town Hall, 7.30 p.m. WOLVERHAMPTON on Saturday 31st August, Wulfrun Hall, 3 p.m. and 6 p.m.

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A Russian naval rocket – with such colossal striking power poised on both sides of the Iron Curtain, another war could well be the last

After the First World War there was a revulsion against this 18th- and 19th-century idea of regarding war as legal. The Covenant of the League of Nations (1920) and the Kellogg-Briand Pact (1928) 'outlawed' war as a method of settling disputes between nations, and established the principle of arbitration. If a nation indulged in war it should be punished by the League. Of course history shows that the League was weak, and that German and Italian aggression could be conducted by means 'short of war'. They called their acts of aggression 'reprisals', 'pacification', and 'restoring order'.

Nevertheless it was precisely for the violation of the laws which made war an international crime that many Nazi leaders met their deaths following the Nuremberg Trials of 1947.

After the Second World War the United Nations Charter laid down that in every war one nation was the victim, and the other the aggressor. It was thus the duty of the United Nations to enforce sanctions upon, and if necessary punish, the aggressor. For this reason terms like 'armed hostilities' and 'armed conflict' have become commonplace substitutes for what a century ago would have been called a 'war'.

The laws of war

So far we have dealt with the legality of war as a whole – now let us take a look at the laws relating to the actual conduct of a war. There have been many attempts to lay down a code of laws which must be observed by the belligerents.

In 1864 the first Geneva Convention laid down certain rules for the treatment of prisoners-of-war, and these were elaborated at the Geneva Convention of 1906. It was agreed that prisoners-of-war should receive medical attention, be able to send and receive parcels, and earn money according to their rank. In 1929 was added the important clause that 'reprisals' against cruel or illegal acts by other countries were not to be taken against prisoners-of-war. (At the end of the Second World War it was only a breakdown in communication that prevented the execution of an order by Goebbels violating this convention.)

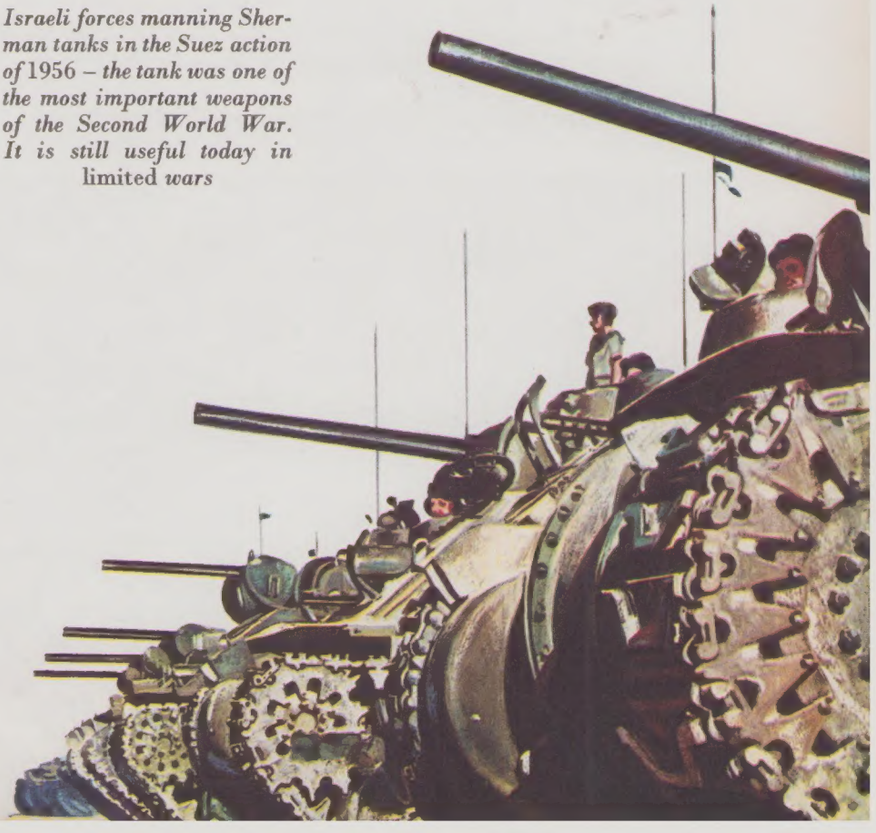
In 1899 a Hague Conference met to try to reach some agreement on methods of conducting war. In 1907 another Hague Conference laid down that certain types of weapons were not to be used in war: explosive missiles dropped from balloons; expanding or explosive bullets; and poison gases. In addition floating mines were forbidden, unless they exploded within an hour of being laid down, and merchant shipping was not to be destroyed.

All these rules were violated during the First World War, although the ban on poison gases and a later ban on bacteriological warfare were observed in battle in the Second World War.

Types of war

We have looked at the ideas governing the conduct of warfare: now let us look more closely at the wars themselves. In the last 100 years there have been three main kinds of war: (1) a civil war; (2) an imperial war when a country sets out to colonise territory whose inhabitants belong, almost invariably, to a different standard of civilisation; (3) an international war between sovereign states of comparable civilisations. International wars are by far the most significant, although civil wars have often been extremely costly in life. International wars can be divided into two categories. In the first there is a *limited* objective, and peace is made when that is accomplished. The second is when such a war develops into a *total* war, with a country, or perhaps many countries, fighting for their very

Israeli forces manning Sherman tanks in the Suez action of 1956 *– the tank was one of the most important weapons of the Second World War. It is still useful today in* limited *wars*



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existence with all resources open to them. The most recent example of a total war was the Second World War.

The Second World War

The Second World War was fought to destroy aggression in Europe by the 'axis' powers, Germany and Italy, and aggression in the Far East by the 'axis' ally Japan. Opposing them were the 'allies', consisting mainly of Great Britain and her Commonwealth, the Soviet Union, the United States of America, and (until she collapsed in 1940) France.

There has probably never been a nation so completely geared for a supreme war effort as was Great Britain in the Second World War. The people provided in taxation alone no less than £17,000 million. Income tax was nearly doubled from 5*s*. 6*d*. at the war's outbreak to 10*s*. in the £ in 1941. A surtax of the phenomenal figure of 19*s*. 6*d*. in the £ was taken from incomes over £20,000. The conditions endured were terrible. Everything went into the war effort. Iron railings were ripped down to make tanks and guns. Saucepans and cutlery were virtually unobtainable. Food, clothing, and practically everything else were severely rationed.

The Second World War was a total war in every way. It cost Great Britain £30,000,000,000. It was fought by 57 nations. Over 22 million people were killed, including one in 22 of the population of Russia, one in 25 of the population of Germany, and one in 150 of the population of the United Kingdom.

Modern weapons

Finally from the types of war to the actual fighting itself: we have the space only to examine some of the most important weapons of today. The main difference between our present weapons and those of the Second World War is in the use of nuclear explosives. These were used for the first time at the end of the Second World War when atomic bombs destroyed the Japanese towns of Hiroshima and Nagasaki. Today the hydrogen bomb has replaced the atomic bomb as the most powerful weapon of mass destruction. The largest 'H' bomb ever exploded was in a series of Russian tests in 1962. It had an explosive force of over 58 megatons – one megaton is the equivalent of a million tons of TNT. Some idea of this destructive power can be gathered from the fact that in the Second World War no bomb had an explosive force approaching even one ton of TNT. In fact, a British V-bomber could cause more destruction in one raid than the entire allied operations delivered in five years in the Second World War. There have also been great changes in the means of delivering these nuclear explosives. The main striking weapons of Western forces and the Soviet Union are Inter-Continental Ballistic Missiles (ICBM's).

Specially trained troops are 'dropped' by parachute – this method of attack was used for the first time in the Second World War

These missiles have nuclear warheads. The United States has the Minute-Man rocket, which can be fired at a moment's notice, and other missiles like the Atlas, which need half an hour's preparation. The latest A3 Polaris missile has a range of over 2,500 miles, and is fired from a Polaris nuclear submarine. This submarine can remain submerged for six months or more, and at present is virtually undetectable. The United States hopes to have 41 in service by 1968. Both British and American forces are equipped with *stand-off* weapons which are fired from the air some distance from the target. The American Hound Dog can be released some 500 miles from its target by a B52 bomber, which has a range of 3,000 miles. The British V-bomber has a similar range, and fires the stand-off Blue Steel missile.

The future

With the growing effectiveness of these weapons of mass destruction, people have realised that *total* war is out of the question unless large proportions of the human race are to be wiped out. But there is a possibility of a limited war between some of the great powers, so nations are by no means doing away with their *conventional weapons*. In fact, most of the great powers today are able to fight two totally different types of war: one with conventional weapons, which might be recognisable to those who fought in the Second World War; the other, which could be over in a few minutes.

The prevention of war

The main problem the world faces is to prevent a major war breaking out again. International Law has not proved particularly effective in this. In 1920 and 1928 there were regulations banning war altogether, but in 1939 the Second World War broke out. The regulations prohibiting poison gas were disregarded by the Nazis – poison gas was used in their extermination camps like Auschwitz. Nevertheless, if International Law fails again, there will be no further chance to find a formula to make it work; most of the world's population may be wiped out. The next war could well be the last.